Learning Gradient Fields for Shape Generation

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Abstract

In this work, we propose a novel technique to generate shapes from point cloud data. A point cloud can be viewed as samples from a distribution of 3D points whose density is concentrated near the surface of the shape. Point cloud generation thus amounts to moving randomly sampled points to high-density areas. We generate point clouds by performing stochastic gradient ascent on an unnormalized probability density, thereby moving sampled points toward the high-likelihood regions. Our model directly predicts the gradient of the log density field and can be trained with a simple objective adapted from score-based generative models. We show that our method can reach state-of-the-art performance for point cloud auto-encoding and generation, while also allowing for extraction of a high-quality implicit surface. Code is available at this https URL.